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AUTHOR Reisner, Elizabeth R.
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ABSTRACT

The National Center for Education Statistics (NCES), in its expansion of data reporting, should consider approaches for studying the curricular content of elementary and secondary instruction and student achievement of curricular goals. More specific information is needed about the curricular content of U.S. education. For example, data collected on the average years of high school mathematics studied do not indicate what proportion of graduates have studied algebra, trigonometry, or calculus, or which skills have been mastered. This information would be useful for college and vocational planners, for program evaluation and planning, and for fiscal accountability. Better data on curriculum and achievement would also allow comparisons across educational agencies and their programs and comparisons across time to assess trends. Data on instructional content and methods could include courses of study, enrollment, major skills taught, local and state guidelines, teaching methods, teacher qualifications, and supervisor role. Testing of students' mastery of instructional content should involve different difficulty levels, the full breadth of content, and different types of achievement sought by different teaching methods. Problems which are likely to be encountered in designing these new data collection activities involve: agreement among the interested parties; public perception of burden and expense; inappropriate comparisons; and diverse educational goals. (GDC)

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NEW AREAS FOR EDUCATIONAL DATA COLLECTION: WHAT STUDENTS ARE TAUGHT AND WHAT THEY LEARN

Elizabeth R. Reisner
Policy Studies Associates

In the next several years pressures are likely to grow for the federal government to expand its reporting of what elementary and secondary students are taught and, from the instruction to which they are exposed, how much they learn. Gathering accurate data in these two areas will present major challenges both to the National Center for Education Statistics, because of the technical problems of survey and analysis design, and to its parent the U.S. Department of Education, because of the policy debate these proposals and plans will inevitably provoke. To meet these challenges, NCES should begin now to consider approaches for gathering and reporting data on (1) the curricular content of elementary and secondary instruction and (2) students' achievement of the curricular goals that are set for them.

This paper provides an overview of topics related to federal data collection in these areas. The first section reviews the current need for such data. The second section explores how data in these areas could actually be collected. The third section surveys several problems to be addressed in designing these data collection activities.

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Why We Need Better Information in These Areas

At present federal agencies provide extensive information on many aspects of American education. For example, comprehensive information is available on what have been termed the inputs of the American education system; these include the characteristics of participating students, the fiscal resources available to elementary and secondary education, the structure established to govern educational activities, and other components of the system. We also know something about the processes that affect education, including the interlocking character of governance decisions at local, state, and federal levels and the supply, assignment, and supervision of teachers and other staff. With regard to educational outcomes, we know how students score on tests that measure knowledge and critical thinking, using standard test items for students in very different schools and localities.

These measures do not, however, permit us to form generalizations about the curricular content of instruction or students' mastery of that content. For example, although we may know that high school students in a given state complete an average of three units of mathematics prior to graduating, for most states we do not know what proportion of graduating students take Algebra II, Trigonometry, or Calculus, nor do we know what mathematical skills and concepts are typically taught in each of these mathematics courses in a state. Without such information, we cannot legitimately compare the mathematics program in one state with the program of another state whose graduates typically complete fewer units of mathematics prior to graduation.

Similarly, without data describing students' mastery of the mathematics curriculum in their schools, we cannot conclude whether the completion of three units of mathematics in a state generally results in (1) mastery of a larger range of mathematical skills and concepts and (2) more thorough mastery than is achieved in a state whose students generally complete fewer units.

It is not surprising that the federal government has avoided collecting detailed data in these areas. As discussed later in this paper, it is a particularly difficult thing to do.

Nevertheless, the task is important, as illustrated in three recent reports on proposals for change in higher education (Bennett, 1984; National Institute of Education, 1984; and Association of American Colleges, 1985). The three reports look critically at the content of current undergraduate curricula and propose ways of upgrading it. Because of the sparsity of national data on undergraduate curricula, the conclusions of these reports are based on anecdotal evidence of what college curricula currently include and on small-scale surveys of course titles in selected colleges and universities. If these data were more complete, the authors of these reports would be able to make their recommendations more persuasively and indeed might find greater congruence among their analyses. Similarly, the lack of data on the content of elementary and secondary schooling precludes accurate analysis of the extent to which students are receiving instruction in skills and subject areas needed for successful transitions into these postsecondary programs.

Our lack of information on what students are taught and what they learn makes it difficult for us to analyze the fit between elementary and secondary schooling and the range of post-high school paths taken by young adults. For students going on to postsecondary schooling, college and university planners need to know what content and skills have been presented to high school students in order to design appropriate entry-level courses; in particular, postsecondary planners need to know how the content of high school programs is changing, in order to adjust entry-level undergraduate courses accordingly. For example, if recent national attention to science and mathematics instruction has actually increased students' exposure to and mastery of skills and information in these areas, entry-level undergraduate courses in science and mathematics should be upgraded to reflect these changes. For high school graduates moving directly into jobs, postsecondary vocational training, or military service, analysis of high school course content, students' mastery of it, and trends in content and mastery can indicate whether high schools are adequately preparing students for changing vocational requirements and whether changes at the high school level reflect trends in job requirements.

These data are also needed for other policy purposes. For example, they can provide a yardstick for educational agencies to compare their own programs and performance with those of comparable agencies. This information can help them identify instructional areas of relative weakness and strength. Data on instructional content and mastery can also provide a baseline for

agencies to assess changes in their programs and student performance over time. This type of analysis is more useful than a static comparison of an agency's program and performance across two points in time because it permits comparison with changing national trends.

At the broadest policy level, these new data are needed to address growing demands for accountability in the expenditure of public funds. As the competition for limited tax revenues becomes more intense, legislative bodies, the media, and taxpayers increasingly require that the value of educational and other social service expenditures be concretely justified. These demands are likely to be particularly insistent in the states that have recently enacted educational reform proposals -- and new revenue raising and spending plans to implement them.

These growing requirements for programmatic and fiscal accountability provide our backdrop for consideration of how these needs can be addressed.

How to Obtain Better Data on Curriculum and Achievement

Information on curriculum is considerably easier to obtain than information on students' mastery of it. In either instance it is essential that information requests be limited to the minimum needed to yield simple data capable of meeting the needs already discussed. For purposes of designing data collection procedures, those needs may be summarized as requirements for baseline measures that permit the following:

- Comparisons across educational agencies to assess relative status
- Comparisons across time to assess change in educational agencies
- Planning by post-high school providers of education and training, including institutions of higher education, postsecondary vocational programs, and the military
- Assessment by the public to determine if expectations for educational delivery and performance are being met

The following discussion focuses first on how NCES could obtain data on the content of students' curriculum to address these requirements. Then we turn to procedures for obtaining data on the extent to which students learn the skills and information contained in the curriculum.

Instructional Content and Methods

The first step in designing procedures to collect data on curricular content is to decide exactly what information is necessary. Possible information categories include for any given subject area (e.g., mathematics, language arts):

- Courses of study offered at each grade, including which are required and which are elective
- Student enrollment in each course
- Major skills, concepts, and information taught in each course
- Local or state guidelines for skills, concepts, and information to be taught in each course
- Primary teaching techniques used in each course (e.g., laboratory or activity-centered; classroom discussion; extensive use of audio-visual materials, computers, or self-instructional materials)

- Subject-relevant qualifications (e.g., academic preservice training, inservice training, years of experience in teaching the course) of teachers teaching each course
- Role of subject supervisors or specialists in teaching (or shaping) the course

These information categories are derived from those used in a study conducted by Weiss for the National Science Foundation, entitled "1977 National Survey of Science, Mathematics, and Social Studies Education." The survey was designed to obtain data on course offerings, curriculum usage, and classroom practices in science, mathematics, and social studies. Besides taking a snapshot of instructional practice in these three subjects, NSF used the survey to determine the extent to which NSF-sponsored materials were being used in classrooms and the self-reported influence of NSF-sponsored programs of inservice training on science, mathematics, and social studies instruction. To improve the quality and comprehensiveness of the survey, an important design step was the review of the draft questionnaire by a large group of consultants with appropriate subject matter expertise and representatives of professional associations with interests in science, mathematics, and social studies education.

Another perspective on the collection of instructional data is provided by a 1981 survey conducted for the Committee on Economic Education of the American Economic Association by Yankelovich, Skelly and White, Inc. The purpose of this survey was to examine "how economics is being taught in America, i.e., who is teaching it, where it is placed in the school curriculum, what the focus is, and what teaching aids and materials economics

teachers are using." As in the NSF project, a number of expert consultants and association representatives were involved in survey design and analysis. This survey collected data in categories similar to the seven listed at the beginning of this section.

The economics survey is particularly relevant to the proposal presented in this paper because it reported information on the instructional content of economics courses, using several sets of focused subcategories. For example, within the category labeled "major skills, concepts, and information taught in each course" in the list above, the economics education survey breaks out two sets of subcategories. The first is called "goals of economic education" and offered respondents the choice among six possible goals, including "to help students understand the current problems facing the country" (reported as a very important goal by 66 percent of all responding teachers) and "to teach students practical skills that they need in their everyday lives, such as balancing a checkbook, using credit cards, how to shop wisely, etc." (reported as important by 65 percent of the respondents). The survey also breaks out a second set of information categories focused on "aspects of economics"; these include 23 headings such as "supply and demand" (the most frequently taught aspect of economics) and "consumer issues/ consumerism" (an aspect taught by 66 percent of all responding economics teachers).

These two surveys demonstrate the feasibility of obtaining nationally representative data on instructional content and

methods. They also suggest the desirability of conducting survey development separately for each major subject area. This strategy would permit the use of expert review panels, such as those used in these two surveys. The panels could play valuable roles in the review and adoption of subject matter categories such as those used in the economics survey. (These categories are available in other subject areas and are sometimes called "taxonomies of educational objectives.")

Students' Mastery of Instructional Content

The preceding section suggests that any testing of students' achievement of curricular goals in a particular subject area should not occur until agreement exists on a discrete set of objectives or topics for that subject area. At that point, grade-appropriate test items can be developed for each topic or objective within a subject area. Obviously, this process will need to be as careful and precise as the development of content categories, in order for the test items for a particular topic at a given grade level to meet criteria such as the following:

- Accurate measurement across a broad spectrum of difficulty levels, in order to determine the level of difficulty mastered by a student
- Assessment across the full breadth of content commonly taught in connnection with a particular objective or topic
- Assessment of differing types of achievement sought using a variety of teaching methods

Although other criteria will be necessary as well, these indicate the challenges in designing standard test items tailored to varying instructional content and methods.

Test administration will require that students be examined using the test items that correspond to the objectives or topics on which their instruction has focused. Test results under this procedure will be a more accurate measure of the effectiveness of instruction than is currently the case with the use of general tests of educational achievement.

Depending on the intended policy uses of the test results, tests can be tailored to instructional objectives at any organizational level desired (e.g., school, district, or state). For example, if a state has established improved mathematics computation as a major statewide goal, all local agencies may be required by the state to test all students in that area. Local agencies could then be permitted to administer tests of other mathematics objectives (e.g., mathematical reasoning) according to local priorities. The ability to tailor such state-level uses for the tests will be a major factor in encouraging voluntary participation in test development and administration and even cost-sharing.

Problems Likely To Be Encountered in Implementing This New Data Collection Focus

Before implementing this proposal, it will be necessary to address and resolve four sets of problems, as described below.

Problems in reaching agreement among educational interests affected by the proposal. This proposal may be seen as intruding on state and local prerogatives in the educational enterprise, because it would require educational agencies to reveal the

priorities they place on different areas of the school curriculum. If widely held, this perception may require that NCES distance itself somewhat from the developmental process. One way to do this will be to rely heavily on the involvement of (1) advisors who are recognized as experts in curricular areas and (2) representatives of professional associations including both those with subject matter orientations and those who represent particular parties in the educational process. Using these groups and individuals to make qualitative judgments regarding the scope and content of necessary surveys and tests is likely to reduce public concern with any seemingly inappropriate federal involvement.

Problems in public perception of excessive burden and expense. The surveys and testing programs just described will inevitably mean new burdens on educational personnel and new public expense. The burden and expense could be reduced by use of smaller samples, although that strategy will prevent local educational agencies and smaller state agencies from obtaining information on their educational programs. The ideal arrangement would be for states and local educational agencies to find the data potentially available from these surveys and tests so desirable that they will use their own resources to pay for them just as states are currently able to contract for National Assessment for Educational Progress (NAEP) results on a statewide basis. Ultimately, however, NCES and ED will simply have to trade off the benefits of these survey and test activities against the Center's other investments.

Problems of encouraging inappropriate comparisons. Like the state protests provoked by the Secretary's "Wall Chart," data generated as a result of the proposed surveys and tests will only be able to describe a part of the educational program of a particular agency. By omitting such important variables as student characteristics, parent and community preferences, and financial resources available for education, the new data could generate misleading comparisons. Analysis of the new data will thus need to consider other, noncurriculum factors in order to avoid erroneous conclusions.

Problems of encompassing diverse educational goals. No matter how broad the participation in the developmental process, the surveys and tests cannot encompass all of the objectives, content, and methods that are used in American elementary and secondary education. Because they cannot possibly be perfectly comprehensive, educational agencies whose programs "fit" the survey structure will obtain more accurate and useful information than will agencies for which the fit is poorer. This problem suggests that the developmental process will need to continue even after full-scale implementation is under way, in order to accommodate state and local diversity and to improve the survey/testing fit across agencies.

Concluding Comments

Because of the potentially large scale of the activities required by this proposal, it is clear that NCES could not launch

any part of it without extensive advance consultation and consensus-building. An early step in this process will be to identify actors in the national educational arena that have already expressed interest in these types of data collection activities and to determine what their particular objectives are. The Council of Chief State School Officers is one such major association and is in fact in a central position to advance and even implement parts of this proposal. A second early step will be to identify ways of limiting the initial implementation of the project. One way would be to confine initial survey and testing activities to curriculum and achievement in academic courses at the secondary level, since the needs and precedents there seem to be clearer than for elementary schooling. Whatever initial limits are adopted, the demand is likely to build for the types of information described here. NCES should begin now to consider approaches for addressing the demand.

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